

only calling into use the fine tips of the third and fourth pairs of thoracic limbs to hold fast its charge. When it fully retires into the case, the claws of the two posterior pairs of legs are pressed backwards against the lining membrane, so as still more effectually to secure its hold on the approach of danger.

II. "On a Self-recording Method of Measuring the Intensity of the Chemical Action of Total Daylight." By H. E. ROSCOE, F.R.S. Received November 27, 1873.

(Abstract.)

The object of the present communication is to describe an instrument by which the varying intensity of the chemically active rays, as affecting chloride of silver paper of constant sensitiveness, can be made self-recording. The method described by the author in the Bakerian Lecture for 1865, although it has been the means of bringing into notice many important facts concerning the distribution of the sun's chemical activity throughout the atmosphere, as well as in different situations on the earth's surface, has not as yet been introduced as a portion of the regular work of meteorological observatories, owing to the fact that, in order to obtain a satisfactory curve of daily chemical intensity, at least hourly observations need to be made, and this involves the expenditure of more time and labour than it has been found possible to give. In the present communication a method is described, which, whilst preserving untouched the principles and accuracy of the former method, reduces the personal attention needed for carrying out the measurements to a minimum, and thus renders its adoption in observatories possible.

According to this plan, a constant sensitive paper is exposed by a self-acting arrangement for accurately known times, at given intervals throughout the day. The insolation apparatus stocked with sensitive paper is placed in position either early in the morning of the day during which the measurements have to be made, or on the previous night, and by means of an electric communication with a properly arranged clock, the sensitive paper is exposed every hour during the day, so that, in the evening, the observer has only to read off, in the ordinary manner, the hourly intensities which have been recorded on the paper during the day.

This self-recording arrangement, though apparently simple, involves points which have rendered its successful completion a somewhat difficult matter, owing, in the first place, to the great variations which occur in the chemical intensity of total daylight in different places, at different times of the day, and in different periods of the year; and secondly, owing to the fact that, in order to be able to estimate the chemical intensity, the coloration acquired by the paper must reach, but not much

exceed, a given tint. It becomes necessary therefore that on each occasion when an observation is needed, the sensitive paper should be exposed mechanically, not once, but for several known, but varying intervals of time, quickly succeeding each other; so that whatever may be the intensity of the total daylight (supposed during these intervals to remain constant), some one at least of the several exposed papers will possess the requisite shade. This is accomplished by a duplicate arrangement of a clock and insolation-apparatus, by means of which disks of the constant sensitive paper are exposed each hour for successive known intervals of time, varying from two to thirty seconds. After an interval of an hour, another set of disks are exposed for the same series of intervals, and these series of insulations are repeated once every hour during the day. The mechanical arrangements for effecting this with accuracy are fully described in the paper. On unrolling, at the end of the day, the strip of sensitive paper which has served for the exposures, black disks showing where the paper has been stationary for the hour are seen, and between each of these are found ten circles variously tinted, from that, probably, scarcely visible, which was exposed for two seconds, to that, perhaps too dark to read off, which was insulated for thirty seconds. Amongst these, some one at least, will be found of such a shade as to enable it to be read off by the monochromatic soda-flame, on a graduated fixed strip, as described in former communications.

A new method of calibrating the fixed strips of standard tints necessary for these measurements is next described, and the question as to the possibility of preparing constant sensitive paper in long strips instead of in large sheets is next experimentally discussed, the result of the examination being that it is possible to prepare silvered paper in long narrow strips such as are used in Morse's telegraph-apparatus, so that it shall throughout its length preserve the standard sensitiveness.

The time during which the disks of constant sensitive paper are exposed is next ascertained for each instrument by a chronograph.

During wet weather the insulator is covered by a semicircular glass shade, and the value of the coefficients for refraction and absorption due to this glass shade is determined.

The latter portion of the communication contains the results of a series of comparisons of the curves of daily chemical intensity obtained (1) with the hand-insulator, and (2) with the self-recording instrument. Comparisons of this nature were made during the months of May, June, and July, 1873, by simultaneous hourly determinations in the neighbourhood of Manchester according to both methods. Of these observations, six full days are selected, and the tables and curves accompanying the communication show the close correspondence of both sets of observations. The integrals of total chemical intensity for these days are also given, and exhibit as close an agreement as, from the nature of the experiments, can be expected.